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An Investigation of the Linkages Between Economic Misery and Disaster Vulnerability

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South Asia is one of the regions with high vulnerability towards climate change and resulting natural disasters. The present study is an attempt to comprehend the implications of economic misery (mi) towards the disaster losses in these countries. Two proxies of disaster losses including i) number of affected persons and ii) number of deaths have been considered. Okun's economic misery index, which is summation of inflation rate and unemployment rate, is used to gauge the economic misery. The fixed effect Panel Poisson regression is applied on annual panel dataset from 2000-2024 for estimation. Results indicate that the economic misery contributes towards the disaster losses and, in turn, disaster vulnerability. On the other hand, growth and trade openness enhance coping capacity by reducing the disaster losses. Higher population growth also positively contributes towards disaster losses. However, these results vary in terms of nature of proxy and disaster type. These results suggest the need of inclusion of economic misery into public policy as a tool for disaster risk reduction because handling of inflation and unemployment can augment the overall welfare and coping capacity.
Keywords: Disaster risk, inflation, unemployment, growth, okun, misery index.

INTRODUCTION

In the recent decades, natural disasters are growing in numbers resulting in the greater damages around the globe. Given the impact of disasters varies across nations, economic and institutional factors play an important role in it. Lesser preparations against disasters often result in greater losses (Cevik & Jalles, 2025). Vulnerability towards disasters is one of the domains of the disaster risk, which is a fundamental part of the sustainable development, that is in line with the Sustainable Development Goals (SDGs) (United Nations). Therefore, the disaster literature has placed greater focus on assessing the impact of economic, socioeconomic and institutional frameworks in context of disaster risk (Botzen et al., 2019). Inflation and unemployment are two important macroeconomic concerns of the public policy. A rapid surge in both inflation and unemployment has negative economic repercussions. High inflation escalates the cost of living whereas unemployment signals difficulty in job hunting (Sanchez & Guzman, 2025). High levels of misery index are associated to lower aggregate demand, which, in turn, is translated to lowering the economic growth levels (Dadgar & Nazari, 2018). In 1970's, Okun applied this analogy to introduce his tool for scrutinizing the economic health known as "economic discomfort index" which is also termed as Okun's economic misery index (Cohen et al., 2014; Gakuru & Yang, 2025). Inflation can be expressed in absolute terms. The absolute value of inflation rate (π) acknowledges that deflation can be equally damaging for the economy (Lovell & Tien, 2000). It can be expressed in the form of equation as follows:

$$mi = |\pi| + u \quad (1)$$

Thus, misery index, to be called 'mi', is a mere summation of the absolute inflation rate (π) and the unemployment rate (u), without assigning any weightage. The higher values of the index are indicative of the greater economic malaise and lesser wellbeing (Henderson, 2015). Therefore, it provides a simple yardstick of poverty assessment as suggested by Grabia, T. (2012).

Deteriorating living standards also contribute towards increasing social problems such as crime rates in the suffering economies which, in turn, may enhance mi. Thus, a vicious circle of economic misery can be developed (Abbas et al., 2024). Although, this parsimonious measure of mi is also subjected to criticism because of its parsimony. Due to this fact, various modifications have been introduced in the misery index such as Barro's mi, which incorporates growth and interest rate. Cohen et al. (2014), Henderson (2015), Hanke

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(2015), Hanke (2021) and Gakuru and Yang (2025) are few others to name. Yet, Okun's misery index has been demonstrated to portray a negative correlation with the consumer sentiments making it a useful indicator (Dadgar & Nazari, 2018).

In the available literature, the impact of the misery index on various economic domains has been well researched. Few researchers have focused on exploring numerous factors affecting the mi, while others have put focus on studying impact of the mi on other macroeconomic and social variables. Such as Dadgar and Nazari (2018) attempted to see if there existed any linkages between growth, governance and mi, in case of Iran. They observed that mi was higher in lower economic growth periods and vice versa. Good governance was associated to reduced mi levels. In addition to this, globalization can also help in lowering mi. In a recent study, Sanchez & Guzman (2025) attempted to analyze the association between Mexico's exchange rate with the United States (US) and its mi. The analysis was based on quarterly data of period that spanned from 2005 until third quarter of 2023 and VAR model was applied for baseline estimation. They confirmed that, in both of the short run and long run periods, exchange rate depreciation had an increasing effect on mi.

Audi and Ali (2022) studied the connections between public policy and mi in the panel of both 31 developed and 35 developing nations. The data set ranged from 1987-2019 and panel ARDL was applied for estimation. Also, mi was estimated with the help of the Principal Component Analysis (PCA). They used three indicators of public policy including government revenue, domestic investment and external debt. The long run results showed that domestic investment and government revenue were effective tools of public policy for the goal of reducing mi whereas population, economic development and external debt had increasing effect in overall sample. Govt. revenue had consistent impact of mi reduction in sub-groups of developed and developing countries. Domestic investment and external debt exhibited decreasing effect in developing nations and increasing impact in developed nations. Population and economic development lead to decrease mi in developed nations and increase in case of developing nations. Thus, public policy seemed to be an important contributor of mi.

Abbas et al. (2024) investigated the role of multiple macroeconomic variables on mi 198 countries distributed over six regions around the globe including Europe and Central Asia, East Asia and Pacific, Latin America and the Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa. Data of the study ranged from 2002 to 2021.They showed that there could exist region wise variation in determinants of mi. Only one of the factors of good governance i.e the political stability had a shrinking effect on mi in all the regions. Also, an increasing effect of gross national expenditures on mi was informally observed across all the regions. However, shrinking effect of broad money growth was observed only in 4 of the regions while similar direction of effect of ratio of imports to exports in 5 of the regions. FDI (foreign direct income) showed a lessening impact on mi in 4 regions only. An interesting feature of the study is its findings about presence of a nonlinear relationship between FDI and mi. These results suggest that the policymakers should keep these regional dynamics of the relationship between mi and other macroeconomic variables in view while formulating the economic policies.

Researches have also attempted to explore influence of the economic misery index on other macroeconomic variables. In one such studies, Wu et al., (2014) studied the impact of mi on health expenditures in nineteen OECD nations. They took aid of data ranging between 1980-2010 and used the Panel Smooth Transition Regression (PSTR) for estimation purpose. Results exhibited a tradeoff between reduced mi and lowering the growth of health expenditures. Further, the health spending had a nonlinear dynamic path. They observed that in case the mi value of previous period was less than the threshold level, its negative influence on persistence of health expenditures was higher. The opposite was true for mi greater than the threshold level. Mensah et al., (2023) also used MI as a threshold to evaluate the firms "earning management (em) effect".

Heilemann and Schuhr (2025) assessed the validity of Okun's misery index for Germany during the period of 1951 until 2021. They did so by first calculating it in original and modified forms and then used survey derived measures of economic performance for validation. Findings supported the basic indicators of mi, including unemployment and inflation in comparison to the modifications. However, it was observed that the strength of impact of unemployment was almost double than the impact of inflation. Further, due to conveniently available data for a large period for mostly countries makes 'mi' a valuable tool for assessment of economic malaise. Earlier, Lovell and Tien (2000) have also observed the validity of, what we call, the Okun's misery index as a tool of consumer sentiments.

Although, as per available literature, the direct impact of mi has not been evaluated on disasters losses, yet researches have analyzed the individual effects of inflation and unemployment, which indicates importance of these macroeconomic variables in this context. Tasri et al., (2022) observed that there existed a significant relation between unemployment and the disaster losses. The conclusion was based on data set from 1990 to 2019 collected from Indonesia. The Structural Equation Model_Partial Least Squares (SEM_PLS) method was applied for estimation in this study. Tselios and Tompkins, (2020) also suggested that higher unemployment rates lead to greater disaster vulnerability. They further found that population density was also positively associated to the disaster vulnerability. Padli et al., (2018) observed that unemployment had a heterogenous effect

according to the type of disaster. Population had a positive impact whereas growth and trade openness, mostly negatively affected the disaster losses, in case of different types of disasters included in the analysis.

In addition to this, few studies have analyzed that how disasters can generate inflationary spikes. Such as Beirne et al. (2024) concluded that occurrence of the natural disasters was responsible for inflationary pressure in the economy. The data of euro zone for 1996 to 2021 was applied for analysis in this research. Results exhibited that due to natural disasters, adverse supply side and higher demand side spikes were observed for the reconstruction purposes. Parker (2018) also observed the occurrence of disaster generated upward trend in food inflation. However, a heterogenous response was observed with varying type of disasters and for different sectors. With the aid of panel data of 168 countries, Songwathana (2018) revealed that the income level of a country determines its level of damages. He found that higher income levels lead to a drop in total causalities but otherwise increased the damages. He made this conclusion based on the data ranging from 1990 to 2016. Briguglio et al., (2009) also that trade openness, few exports, and import of essential items are determinants of the susceptibility towards shocks.

In light of the above, this study is going to assess that whether economic misery can potentially affect the disaster losses with a particular attention to selected South Asian economies. Misery index (mi) has been calculated as per equation (1). It is a novel and fresh evidence in the light of the available literature, based on panel data of South Asian countries for 25 years spanning from 2000 to 2024. This study will help us to understand that how economic implications affect the disaster vulnerability in the region of study.

RESEARCH METHODS

***Data*:** The current study undertakes an unbalanced panel data of five South Asian economies, which are selected on the basis of data availability. These include Bangladesh, Sri Lanka, India, Pakistan, and Nepal. These nations are highly populous and facing the challenges of natural disasters. The dataset ranges from the year 2000 to 2024.

Data is collected from "World Development Indicators (WDI)" and Emergency Events Database (EM-DAT). For the dependent variable, disaster losses, i) total number of affected persons (affect) and ii) number of deaths (deaths) (Lin, 2015) annually, for natural disasters (floods, storms, earthquakes and high temperatures) are taken. For any event to be declared as disaster, at least one of the five criterions should be fulfilled including i) 10 mortalities ii) 100 affected people iii) emergency declaration and iv) request for international assistance. In the EM-DAT database, the total number of affected persons is calculated as a summation of injured, homeless and affected after a disaster event. Total deaths are total fatalities resulting from the disaster. Misery index is a sum of inflation (in absolute terms to incorporate deflation as equally damaging for the economy as inflation) and unemployment rate. A detailed description of the explanatory variables, their description, unit of measurement and source is placed at Table 1.

Model: The Poisson fixed effect model takes on the following form.

$$f(y_{it}|x_{k,it}) = \frac{\exp(-\mu_{it})\,(\mu_{it})^{y_{it}}}{\Gamma(y_{it}+1)}\,,\ \mu_{it} = \exp(\lambda i + x`_{k,it}\theta)$$

Here, i = 1, 2, 3, 4, . . . , N and t = 1, 2, 3, 4, . . . , T such that i represents cross sectional units and t shows time. The dependent variable (y_{it}) is a count data. x is a vector of k explanatory variables, λ_i demonstrates unobserved cross sectional effect that do not vary with time but allowed to fluctuate among the cross sectional units. θ is the vector of the parameters, and u_{it} is the error term (Green, 2007).

***Estimation*:** The dependent variable in this model is disaster losses whereas independent variables are misery index (mi), economic growth (gdppc) population growth (popg) and trade openness (to). Two proxies of disaster losses i.e affect and deaths have been used for estimation. This model is utilized to assess the impact of economic misery on disaster losses to grasp the vulnerability or resilience against disaster losses. It can be written as follows:

$$dl = f(mi, gdppc, popg, to)$$

The dependent variable included in the model is count data. A variable is said to be the count data if it takes only positive or zero values and it is not possible to take on the negative number such as number of affected persons or deaths due to disasters. In this situation, with count data, Poisson fixed effect model is the most famous methodology (Woolridge, 2010). Presence of fixed effects is also supported through the Housman test. Woolridge (1999) suggests that the fixed effect Poisson performs better even in over dispersion as it is robust to the serial correlation. Therefore, the fixed effect panel Poisson Regression with robust standard errors is applied for

Table 1. Description of the explanatory variables, their description, unit of measurement and source.

Variable	Abbreviation	Units	Source
Misery Index	mi	Sum of Inflation (consumer prices: annual % in absolute terms) and Unemployment (% of total labor force) (modeled ILO estimate)	WDI + self-calculation by author
Growth	gdppc	GDP per capita (constant 2015 US$)	WDI
Population Growth	popg	Population Growth (Annual, in percentage)	WDI
Trade Openness	to	Trade (as percentage of GDP)	WDI

Table 2. Descriptive analysis.

Variables	Total Obs.	Mean	Std. Dev.	Min.	Max.
affect	122	6175634.000	10818087.000	5.000	50416051.000
deaths	122	1946.893	7775.221	2.000	74138.000
mi	124	13.676	6.278	3.544	54.249
gdppc	120	1575.509	1011.665	547.221	4495.710
popg	120	1.202	.736	-2.800	2.825
to	115	41.645	13.229	21.460	88.636

estimation due to presence of heterogeneity among the cross sectional units.

RESULTS

The descriptive analysis can be viewed at Table 2. There are 122 observations for the both proxies of the dependent variables included in the estimation. Mean value of the 'affect' is 6175634, reflecting the count nature of the data and scale of overall affected persons, on average. On the similar line, average number of 'deaths' are 1947 (approximately), which are comparatively lower than the number of affected persons. Among the other variables, mi has the average value of 13.676 with a dispersion rate of 6.278, less than the average value. Also, the standard deviation of 'gdppc' is 1011.665 which is again less than its mean value which is 1575.509. It can also be observed that the population grows at an average rate of 1.2% whereas trade openness stands, on average, at 41.645%.

The Table 3 shows that the problem of multicollinearity does not exists in the dataset as all values of vif are less than 10, with mean vif<3.

Table 3. (VIF)

Variables	affect		deaths	
	VIF	I/VIF	VIF	I/VIF
mi	1.21	0.824982	1.22	0.819661
gdppc	1.14	0.880611	1.13	0.881129
popg	1.31	0.765608	1.38	0.723690
to	1.29	0.777491	1.32	0.755228
mean vif	1.24		1.27	

After confirming the absence of multicollinearity, as suggested by Woolridge (1999), the fixed effect Panel Poisson Regression is applied, with robust standard errors, on both proxies of disaster losses. These include number of affected persons due to disasters (affect) and number of deaths (deaths) due to disasters. Results are placed at Table: 4, which reflect that misery index significantly raises the number of affected persons; however, it has insufficient impact on disaster related deaths, in the geographical region included in the analysis. Also, trade openness (to) is significantly and negatively related to 'affect'. Additionally, growth (gdppc) significantly leads to shrinking only the number of deaths. A significant wald test shows goodness of fit.

Table 4. Fixed Effect Panel Poisson Regression

	affect	deaths
mi	0.0472**	-0.0352
	(0.0225)	(0.0287)
gdppc	-0.000198	-0.0018***
	(0.000239)	(0.000544)
popg	0.2580	-0.1470
	(0.3460)	(0.7110)
to	-0.0376***	0.0186
	(0.00828)	(0.0237)
No. of Observations	112	112
No. of Countries	5	5
Wald chi2 p-value	= 0.0000	= 0.0000

**** p-value<.01, ** p-value<.05& * p-value<.1*
Robust Standard errors are reflected in parenthesis.

Since, flood is a frequently occurring natural calamity in the South Asian region, the impact of economic misery is individually assessed on it. Results are placed in Table:5 which reflect that economic misery (mi) significantly and positively increases both, the number of affected persons as well as number of the deaths. Higher population growth is also significantly and positively impacting both of these terms. On the other hand, growth (gdppc) and trade openness (to) have negative and significant influence on both proxies of the disaster loss, in case of flooding.

Table 5.

	affectf	deathsf
mi	0.0541*	0.0289***
	(0.0283)	(0.00558)
gdppc	-0.000414***	0.000362***
	(0.000130)	(0.000138)
popg	0.4760**	0.3670***
	(0.224)	(0.122)
to	-0.0374***	0.0157***
	(0.00664)	(0.00351)
No. of Observations	108	106
No. of Countries	5	5
Wald chi2 p-value	= 0.0000	= 0.0000

**** p-value<.01, ** p-value<.05& * p-value<.1*
Robust Standard errors are reflected in parenthesis.

DISCUSSION

The results suggest evidence of negative outcome of economic misery on disaster losses, especially, in case of the flooding. These results are partially in line with the earlier findings of Tselios and Tompkins, (2020) and Tasri et al., (2022) who have studied individual impact of unemployment on disasters as no study has explicitly evaluated impact of the misery index on it, as per the available literature. Keeping in view these results, especially, in context of flooding, handling of the economic misery can reap the benefits of resilience against the disaster risk in the South Asian countries. Thus, it should be given important consideration in the public policy of countries of this highly populous region. Economic misery directly and adversely impacts the consumer's economic wellbeing which, in turn, reflects its coping capacity.

Findings also reflect that trade openness and growth are helpful in reducing the disaster related losses. These results are in line with the findings of Padli et. al., (2018). It, once again, reflects that how economic strengthening can be helpful in enhancing the overall coping capacity of a country, especially, in case of the under developed ones. Also, the impact of population growth is positive in case of flooding which indicates the significance of demographic factors.

***Robustness*:** This study evaluates robustness of the results with the help of GEE (Generalized Estimation Equations) method. Results are reflected in the Table 6. Results reflect that the effect of mi is consistent in this model as well. Economic misery is associated with greater disaster losses. Signs of other variables are also robust.

Table 6.

	affect	deaths	affectf	deathsf
mi	0.0354*	-0.0195	0.0452*	0.0186**
	(0.0198)	(0.0310)	(0.0235)	(0.00844)
gdppc	-0.00048***	-0.000128	-0.0008***	0.000169
	(0.00018)	(0.00026)	(0.00016)	(0.00012)
popg	0.171***	1.178***	0.320***	0.256*
	(0.0655)	(0.338)	(0.0900)	(0.146)
to	-0.0445***	0.0335***	-0.0476***	0.0136
	(0.00994)	(0.00691)	(0.0135)	(0.00958)
Constant	17.24***	4.987***	17.17***	4.725***
	(0.887)	(1.401)	(0.715)	(0.628)
Obs.	112	112	108	106
Countries	5	5	5	5

**** p-value<.01, ** p-value<.05& * p-value<.1*
Robust Standard errors are reflected in parenthesis.

Conclusion: This study attempts to underscore the importance of economic variables in context of disaster losses in five South Asian economies for a data spanning from 2000 until 2024. Two important proxies are used to gauge disaster losses including i) the number of affected persons and ii) number of deaths due to natural disasters. Misery index (mi) is used as an indicator of the economic malaise. It is a simple summation of two of the macroeconomic tools including the inflation rate and unemployment while taking inflation in absolute terms to incorporate negative role of deflation as well. Due to count nature of data, the fixed effect Panel Poisson Regression is applied for estimation of the coefficients as suggested by Woolridge (1999).

Results indicate that economic malaise increases the disaster vulnerability as it is positively related to the disaster losses, especially in case of flooding. Among the other contributing factors, the population growth positively and significantly augments the disaster losses but only in case of flooding. Results also reveal that growth (gdppc) and trade openness (to) can be helpful in lessening the disaster vulnerability in the South Asian region by augmenting economic welfare.

In light of the findings, this study suggests that economic strengthening can be used by the policymakers for building up resilience. For this purpose, better economic ties can be helpful. Additionally, trade should be promoted to build up coping capacity. Further, acknowledging the fact that Okun's misery index is a simple tool for assessment of economic misery, future research can be undertaken by using its modified versions.

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***SDGs addressed*:** No Poverty, Decent Work and Economic Growth, Industry, Innovation and Infrastructure .

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